Cargill Salt

September 28, 2004

Ms. Teresa Seidel
District Supervisor
MDEQ Air Quality Division
SE Michigan District Headquarters
38980 West Seven Mile Road
Livonia, MI 48152-1006

Re: Boiler No. 5 Total Suspended Particulate August 24-25, 2004 results

Dear Ms. Seidel:

Please find enclosed performance test results for EGBOILER5 and EGDURCABE and lab test report for the coal sampled during the performance test of Boiler #5. Both sources were on tested August 24-25, 2004 for Total Suspended Particulate. Tom Gasloli, and James Voss of the MDEQ witnessed the tests. These tests satisfy condition III.B.3 of Table E-01.1 EGBOILER5 and conditions III.B.3 and III.B.6. of Table E-03.1 EGDURACUBE, under ROP permit #199700084.

The testing of EGDURACUBE was completed with all systems operating in the Duracube production system. During the Duracube testing, pressure drop and water flow on the scrubber were recorded approximately every 15 minutes. The average value of the pressure drop during the testing was 2.63 inches of water and the average water flow was 59.3 gallons. Per condition V.1. of Table E-03.1 EGDURACUBE, Cargill proposes to change the operational parameter of the pressure drop reading to a range of 1.8" to 3.4". This range represents +/- 30% of the average value observed during the test. Cargill also proposes to set the minimum water flow at 42 gallons/minute, minus 30% of the average value observed

The testing of Boiler #5 was completed with the boiler operating at a capacity greater than 90% of the boiler's maximum of 100,000 pounds of steam per hour. This testing satisfies condition V.3. of Table E-01.1 EGBOILER5, allowing Cargill to operate the boiler at "a maximum production rate not to exceed 100,000 pounds of steam per hour." We plan to begin operating the boiler this rate beginning October 1, 2004.

As you note from the Boiler #5 compliance test, the average TSP emission rate of 0.126 lbs/1000 cu. ft. of exhaust gas was well below the permit limit of 0.300 lbs/1000 cu. ft. The recent test result was also a significant improvement over the previous compliance test conducted on February 27, 2002. This test resulted in an average TSP emission rate of 0.287 lbs/1000 cu. ft. The February 27, 2002 test was conducted at lower operating rate due to airflow restrictions. The boiler improvements that Cargill has been implemented over the past 3 years has significantly improved the performance of the boiler allowing Cargill to operate the boiler and full capacity with an TSP emission rate 42% of the permitted limit. As

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noted in the test report, all testing was completed without natural gas co-fire and soot blowing was performed during one of the test runs.

If you have any questions or comments regarding above-mentioned operating modifications please call me at 810-326-2763

Sincerely,

Daniel Taylor
Environmental Manager

cc: Wade Richards
Gerald Rome
Don Chutas
Luca Martino
Tom Gasloli,
MDEQ, Air Quality Division
PO Box 30260
Lansing, MI 48909

Attachments
NTH test results
Standard Laboratories coal sample results

STANDARD LABORATORIES, INC.
8451 River King Drive
Freeburg , IL 62243-0039

Lab No. 2004-01246-001

Date Rec'd 8/31/2004

Date Sampled 8/24/2004 to 8/24/2004

Sampled By CLIENT, S.SAWHER

Date: 09/17/2004 14:23:47

P.O.#: 20214635

CARGILL SALT DIVISION
916 S. RIVERSIDE AVE.
ST. CLAIR, MI 48079-5335

ATTN: DONALD J. CHUTAS

Sample Identification

CARGILL SALT ST. CLAIR, MI. - STATE COMPLIANCE TSP TEST
COAL COMPOSITE SAMPLE (UNCRUSHED)

LBS SO2 / MMBTU : 2.09

	% Moisture	% Ash	% Volatile	% Fixed Carbon	BTU / LB.	% Sulfur
As Rec'd	4.09	7.15	38.39	50.37	13212	1.38
Dry Basis	*****	7.45	40.03	52.52	13775	1.44
M-A-Free					14884	
Method	D3302	D3174	D3175	D3172	D5865	D4239

FREE SWELLING INDEX (D720) : *****

ASH FUSION TEMPERATURES (DEG F)	REDUCING	OXIDIZING	D1857
INITIAL	*****	*****	
SOFTENING	*****	*****	
HEMISPHERICAL	*****	*****	
FINAL	*****	*****	

HARDGROVE GRINDABILITY INDEX (D409) : ***** @ ***** % Moisture

Note: ***** INDICATES ANALYSIS WAS NOT PERFORMED

Respectfully Submitted, Al Mjunk

REVISED
Test Report For:

Total Suspended Particulate Concentration and Emission Rates And Visual Emissions From the Duracube Exhaust Stack Located at Cargill Salt Inc. St. Clair, Michigan

Test Date: August 25, 2004

Prepared For:

Mr. Dan Taylor
Cargill Salt Inc.
916 South Riverside Avenue
St. Clair, Michigan 48079

Project Number 16-040760-01
September 17, 2004

Submitted by:
NTH Consultants, Ltd.
Todd Wessel
(616) 575-1022
Barry Broering
(616) 575-1011

TABLE OF CONTENTS

EXECUTIVE SUMMARY

NTH Consultants, Ltd. (NTH) was retained by Cargill Salt Inc. (Cargill) to conduct total suspended particulate (TSP) emissions testing and Visual Emissions (VE) testing on the EGDURACUBE (Duracube) exhaust stack being operated at the Cargill facility in St. Clair, Michigan. The testing was performed in accordance with conditions specified in Michigan Department of Environmental Quality (MDEQ) – Air Quality Division (AQD) Permit Number 199700084. The testing consisted of three (3) one-hour test runs for TSP and three (3) one-hour VE tests on the Duracube exhaust stack. The results of all testing can be found in Table 1, located at the end of this report and are summarized below:

Table E-1

Summary of Total Suspended Particulate Test Results

Source	Test Parameter	Emission Rate *	Permit Limit
EGDURACUBE	TSP	0.02 lbs/1000lbs, dry gas basis	0.10 lbs/1000lbs, dry gas basis

* Results are presented as three (3) run averages.

Table E-2

Summary of Visual Emissions Test Results

Source	Visual Emissions (Opacity) * %	Visual Emissions (Opacity) Permit Limit %
EGDURACUBE	0.25	20

* Results are presented as three (3) run averages.

1.0 INTRODUCTION

NTH Consultants, Ltd. (NTH) was retained by Cargill Salt Inc. (Cargill) to conduct total suspended particulate (TSP) emissions testing and Visual Emissions (VE) testing on the EGDURACUBE (Duracube) exhaust stack being operated at the Cargill facility in St. Clair, Michigan. The testing was performed in accordance with conditions specified in Michigan Department of Environmental Quality (MDEQ) Permit Number 199700084 and 40 CFR, Part 60, Appendix A, U.S. EPA Reference Methods 1, 2, 3, 4, 5 and 9.

NTH personnel Barry Broering, Joseph Mason and Leona Taylor performed the testing. The testing was coordinated through Mr. Dan Taylor of Cargill. MDEQ-AQD personnel Jennifer Barre, Thomas Gasloli and James Voss witnessed portions of the testing.

2.0 PROCESS DESCRIPTION

The Duracube is a system used to produce water-softening pellets and is designated as EGDURACUBE. The process begins with a sodium chloride and small quantities of sodium hexamate phosphate being added to the surge bin. Following the surge bin, the mixture is sent to a compactor, product bin and packaging system. The Duracube emissions are ducted to a wet scrubber and vented to atmosphere.

3.0 TEST REFERENCE METHODOLOGIES

The following U.S. EPA Reference Test Methods were performed for the emission testing:

- Method 1 - Sample and Velocity Traverse for Stationary Sources;
- Method 2 - Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S pitot tube);
- Method 4 – Determination of Moisture Content in Stack Gases;
- Method 5 – Determination of Particulate Matter Emissions from Stationary Sources; and
- Method 9 - Visual Determination of the Opacity of Emissions from Stationary Sources.

3.1 Measurement Location

The number of traverse points for the source was determined in accordance with U.S. EPA Method 1 "Sample and Velocity Traverses for Stationary Sources". The diameter of the EGDURACUBE exhaust stack measured twenty-five (25) inches. A total of twenty (20) measurement points were selected for the exhaust stack flow rate determinations. Two (2) sample ports were utilized for the testing, which resulted in the use of ten (10) traverse points for each port. A diagram of the Duracube exhaust stack and traverse point locations are presented in Figure 2.

3.2 Velocity and Temperature

The exhaust stack gas velocity and temperature measurements were conducted in accordance with U.S. EPA Method 2 "Determination of Stack Gas Velocity and Volumetric Flow Rate". The exhaust stack velocity heads (delta P's) were measured using an S-type pitot tube connected to an inline water column manometer with velocity head ranges of 0 to 10.0 inches of water. Temperatures were recorded in conjunction with velocity head determinations using a chromel/alumel "Type K" thermocouple connected to a pyrometer. Measurements were taken at each traverse point during the particulate testing.

In addition to the volumetric flow rate determination, NTH performed a cyclonic flow check on the exhaust stacks to verify the absence of cyclonic flow. This procedure is referred to as the "nulling technique". The pitot tube was positioned at each traverse point so that the face openings of the pitot tube were parallel to the stack cross-sectional plane. This position is called the "0° reference". The velocity pressure (delta P) measurements were noted. If the delta P reading was zero, the cyclonic angle was recorded as 0°. If the delta P reading was not zero, the pitot tube was rotated clockwise or counter clockwise until the delta P reading became zero. This angle was then measured with a leveled protractor and reported to the nearest degree. After this null technique was applied at each traverse point, the average of the cyclonic angles was calculated. The average result of the cyclonic flow checks was 1.75 degrees for the Duracube exhaust stack. For a site to be

considered non-cyclonic and acceptable for stack testing, the average results must be ≤ 20 degrees. The results of the cyclonic flow checks can be found in Appendix B.

3.3 Molecular weight

Due to the lack of combustion associated with the Duracube system, ambient levels of 20.9% Oxygen, 0.0% Carbon Dioxide and 79.1% Nitrogen were used for calculating the molecular weight of the Duracube exhaust gas stream.

3.4 Moisture

The stack gas moisture content was determined in accordance with U.S. EPA Method 4 "Determination of moisture content in stack gases" in conjunction with the Method 5 Sampling Train. All impingers were weighed before and after each test to determine moisture content of the stack gases.

3.5 Total Suspended Particulate

The TSP concentrations were determined following the guidelines of U.S. EPA Method 5 "Determination of Particulate Matter Emissions from Stationary Sources". Figure 1 presents a schematic of the Method 5 sampling train.

Sample gases were extracted from the sample stream isokinetically through a heated sample probe. The sample gas passed through a heated filter, to remove particulate matter, and into a set of four impingers. The sampling train for the exhaust stack followed the guidelines detailed in U.S. EPA Method 5. The sampling train components were:

- An appropriately sized glass sample nozzle;
- A "S" type pitot tube connected to an inclined water column manometer;
- A thermocouple wire attached to a pyrometer;
- A 3 foot long, heated glass sample probe (heated to prevent moisture condensation);
- A glass filter holder, encased in a heated oven box. (Oven temperatures were maintained at 248°F or greater during testing);
- Four impingers seated in an insulated ice water bath in the following sequence;

Impinger #1
Modified impinger, containing 100 ml of water

Impinger #2
Standard impinger, containing 100 ml of water;

Impinger #3
Modified impinger, empty, to serve as a moisture knockout;

Impinger # 4
Modified impinger, containing approximately 300 grams of pre-dried Silica gel.

The sampling train included the following components in sequence for measuring the sample gases:

a) Umbilical sampling line;
b) Vacuum gauge;
c) Leak-free, oil type pump;
d) Calibrated, dry test gas meter, and calibrated gas flow orifice.

When the sample run was completed, the final dry test meter reading was recorded and the probe was removed from the port. A post-test leak check was performed at the highest sample vacuum measured during the sample run. The final leak rate was recorded on the data sheet. The sample train was sealed from contamination and transported to the staging area for recovery.

Filterable particulate from the front half of the sample train was recovered with acetone. The rinses were placed into a sample container labeled container #1. The level of the rinse was marked on the sample container and the sample container was sealed with Teflon tape. The filter was recovered and placed into a petri dish labeled container #2. The petri dish was then sealed with Teflon tape. The front half particulate rinses and filters were transported to the NTH Air Quality laboratory located in Grand Rapids, Michigan. Upon arrival at the NTH laboratory, the filters were desiccated for a minimum of 24 hours before weighing. The filters (including a filter blank) were weighed to a constant weight (0.5 mg), between two consecutive weighings, with no less than 6 hours of desiccation time between weighings. The final results are reported to the nearest 0.1

mg. The acetone rinses (including acetone blank) were evaporated in pre-weighed aluminum dishes following the same procedures as described above.

3.6 Determination of Visual Emissions

The opacity was determined using U.S. EPA Method 9 "Visual Determination of the Opacity of Emissions from Stationary Sources" and consisted of three one-hour runs. Qualified observer Ms. Leona Taylor of NTH performed the opacity determinations. All of the opacity readings were taken with the sun oriented in the 140-degree sector to the observer's back. The opacity was determined two and one-half (2.5) feet from the stack discharge. The opacity observations were recorded to the nearest 5 percent at 15-second intervals. Ten (10) sets of 24 observations were made for each hour of testing. Averaging each set of 24 observations and dividing by 10 calculated the average opacity. Copies of the Method 9 forms as well as Ms. Taylor's Visual Emissions Certification are presented in Appendix D.

4.0 Calculations

Particulate matter concentrations were determined through the use of EPA Method 5, Section 4.3. The particulate matter concentrations were used in conjunction with the appropriate flow rates to determine particulate matter emission rates.

The following calculations demonstrate the determination of the particulate matter concentration and emission rates from the Duracube exhaust stack, utilizing data from test run #1.

Total Particulate Matter = 37.157 milligrams
Sample Volume = 34.305 dry standard cubic feet
Dry molecular weight, lb/lb-Mole = 28.836

$$\text{PM Concentration (gr/dscf)} = \frac{37.157\text{ mg}}{\text{sample}} \times \frac{\text{sample}}{34.305\text{ dscf}} \times \frac{\text{g}}{1{,}000\text{ mg}} \times \frac{\text{lb}}{453.59\text{ g}} \times \frac{7{,}000\text{ grains}}{\text{lb}}$$

$$\text{PM Concentration (gr/dscf)} = 0.0167$$

$$\text{PM Emissions} = \frac{0.0167 \text{ x } 55.14}{28.836}$$

$$\text{PM Emissions (lbs/1000 lbs gas, dry)} = 0.0319$$

5.0 SUMMARY OF RESULTS

The results of the emissions testing study are presented in Table 1 at the end of this report. The data in the tables includes exhaust gas characteristics, and particulate concentration and emission rates and opacity. The results show that the Duracube is operating within the permit limit outlined in Table E-01.2 EGDURACUBE of Permit Number 199700084.

The following information is appended:

Appendix A: Results, Calculations, and Equations
Appendix B: Field Data Sheets
Appendix C: Laboratory Data
Appendix D: QA/QC Data
Appendix E: Cargill Salt Inc. Process Data

TABLE

NO TABLES OR FIGURES copied